

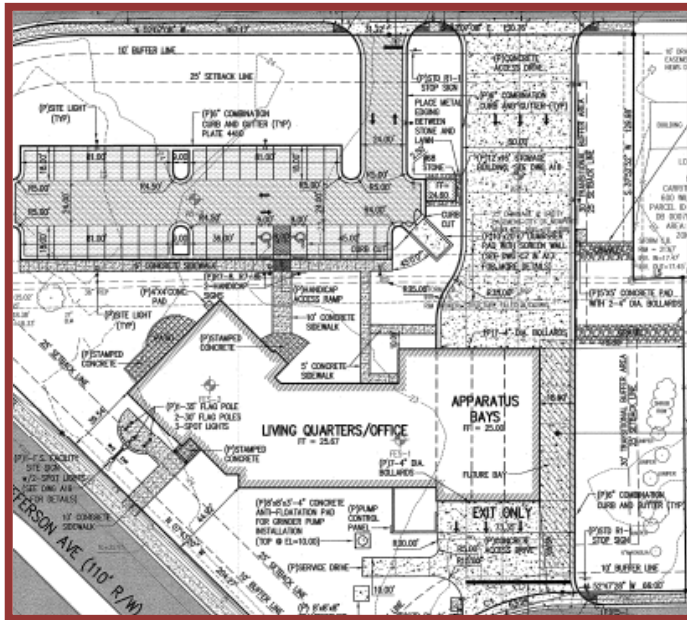
# Traffic Impact Assessment – Fire Station 3 Relocated



**City of Newport News  
Department of Engineering**



MARCH 2010



# Traffic Impact Assessment– Fire Station 3 Relocated

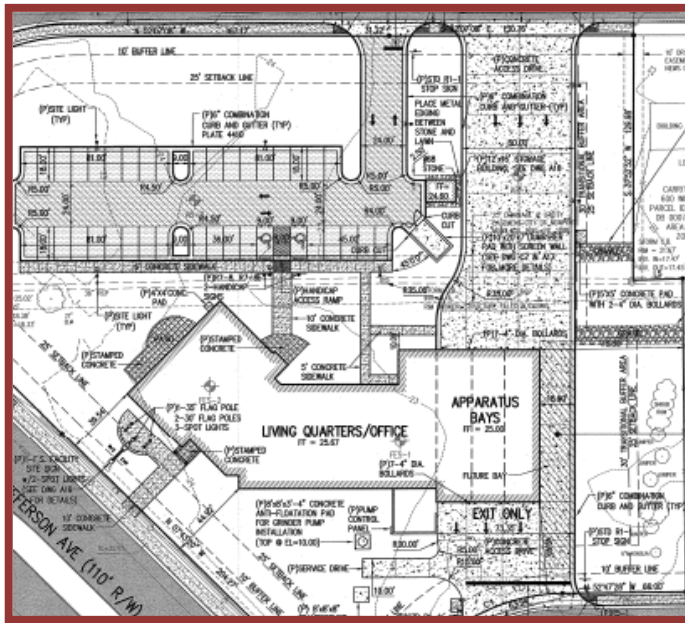
*Prepared for:*

**The Newport News Fire Department  
of the City of Newport News, Virginia**

*By the:*

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Transportation Division**

**March 2010**



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# I Background

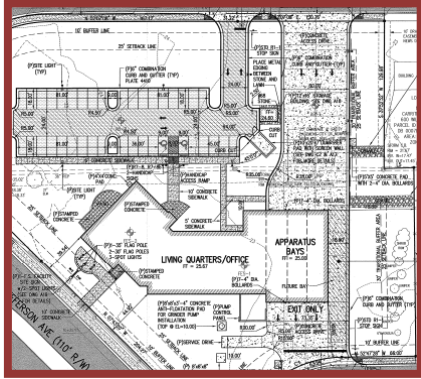
The analysis includes a baseline of 2009 traffic volumes as the base year for main line traffic and was supplemented with specific side street counts conducted in 2010. It is assumed that full build-out of the site will occur in 2010. Analyses were performed to show projected traffic conditions for both the build and no build scenarios. This report presents the results of the analysis and provides recommendations for mitigating impacts and for access improvements.

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Figure 1



# 2 Existing Conditions

Currently Jefferson Avenue is a six lane divided section with a signalized “T” intersection at Hemlock Road with a private entrance opposing Hemlock Road. The intersection of Sedgefield Drive is a “T” intersection with stop control westbound on Sedgefield Drive. To the south of the site, Jefferson Avenue has another signalized “+” intersection with McLawhorne Drive that is included in the analysis. Additionally, the site is located in the transition of an acute angled “T” intersection of Hemlock Road and Willow Drive which is stop controlled for northbound Willow Drive (see Figure 2).

The intersections identified within the area of influence were analyzed to evaluate the existing traffic conditions and document the current LOS at each intersection. Each signalized intersection in the City is on a rotating count schedule. The most recent morning (7:00-9:00 AM) and afternoon (4:00-6:00 PM) peak period turning movement counts were utilized for the two (2) signalized intersections below:

Jefferson Avenue & Hemlock Road-----Count conducted Sept. 2009

Jefferson Avenue & McLawhorne Drive -----Count conducted Sept. 2009

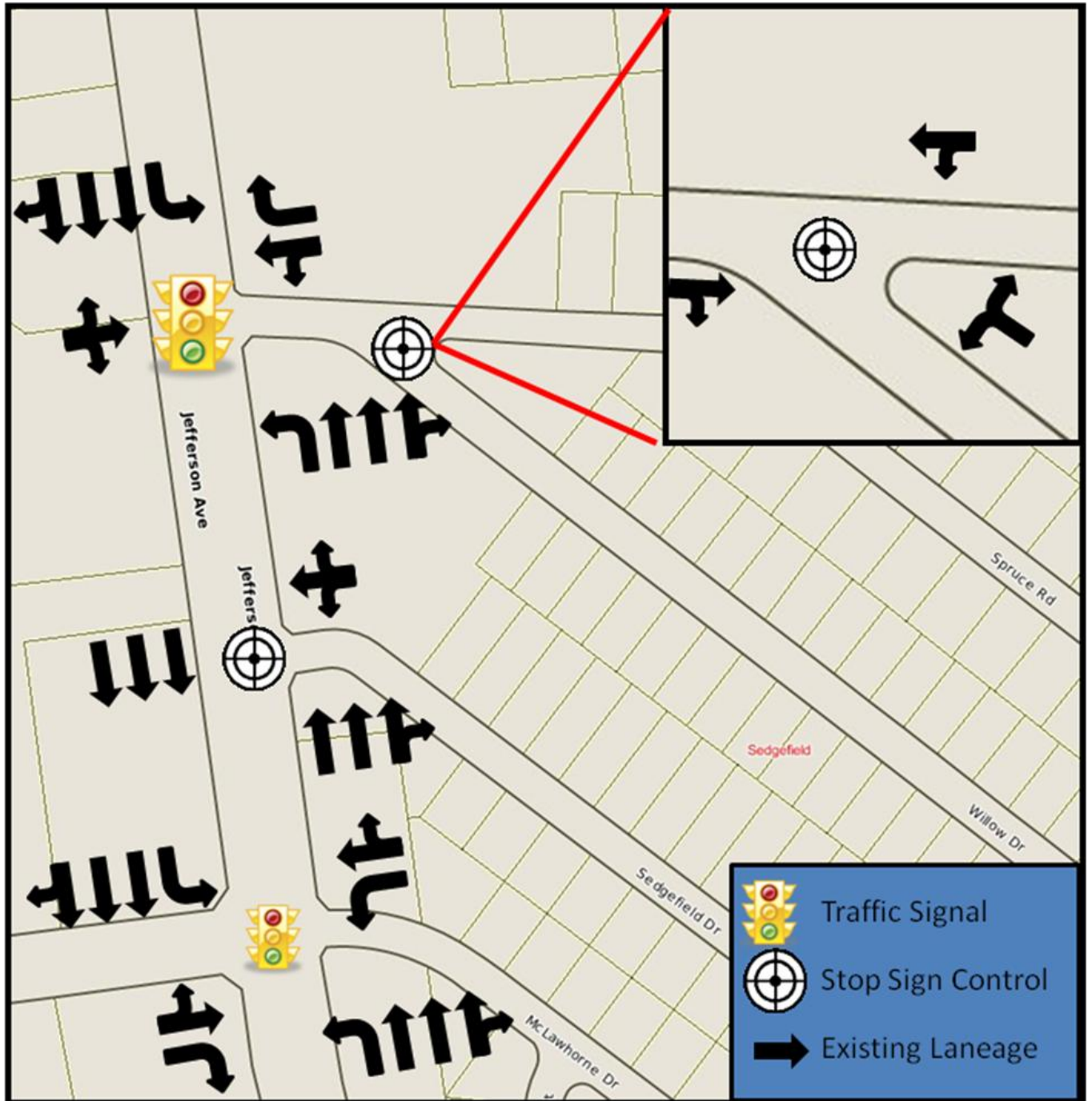


Figure 2

Figure 3 presents the existing daily and peak hour traffic counts.

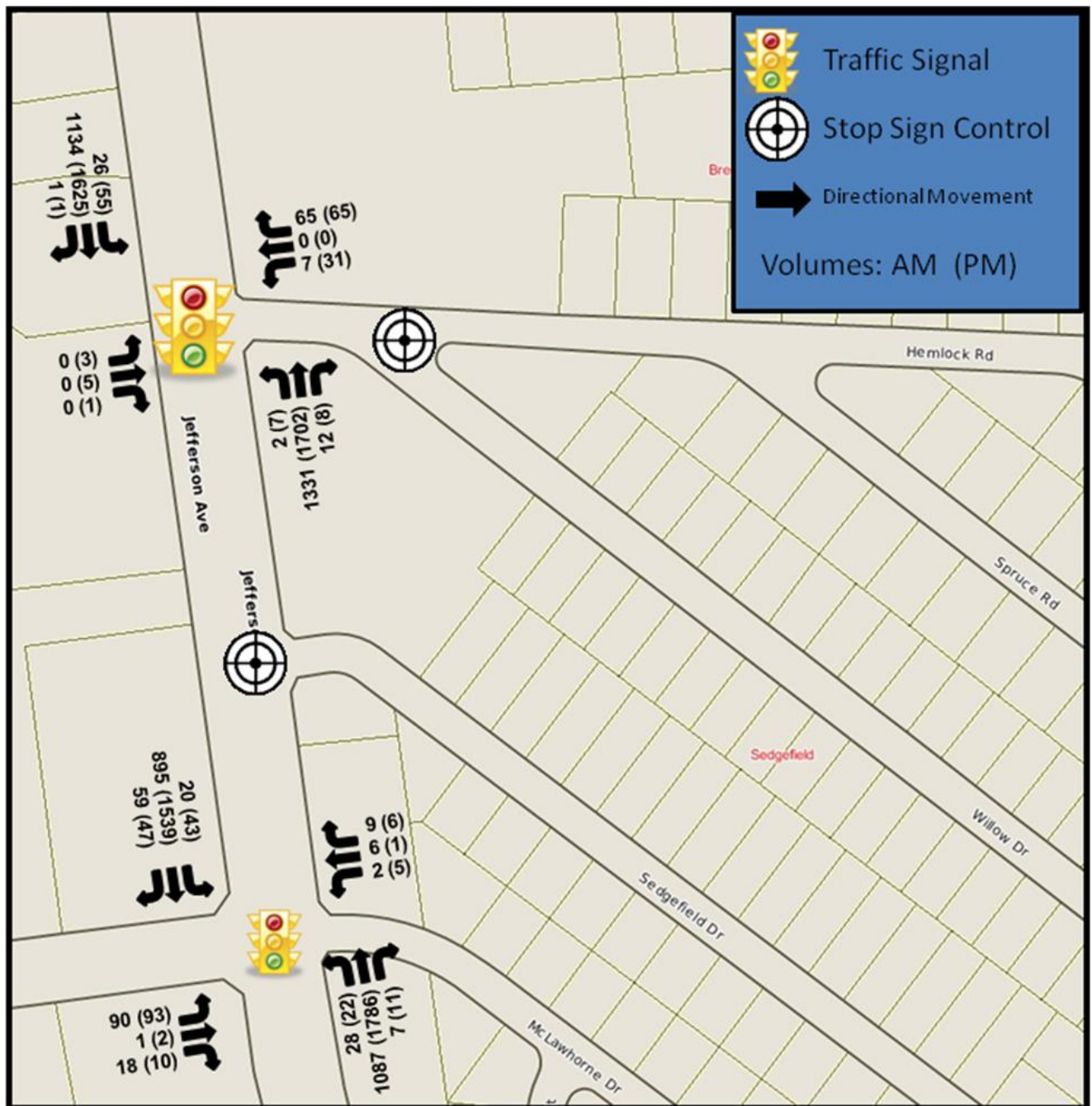


Figure 3



The delay and LOS which correspond with each lane group for the existing conditions are given in table 1.

Level of Service is a qualitative measurement of traffic operations. It is a measure of delay time. The Transportation Research Board's Highway Capacity Manual (HCM) defines six levels of service for intersections, with LOS "A" representing the best operating conditions and LOS "F" the worst. The current update (version 7.0) of Synchro Professional software was used to determine the level of service, corresponding delay and capacity at the signalized intersections. This software is based on the analysis procedures defined in the Highway Capacity Manual. The delay and LOS which correspond with each lane group for the 2009 existing conditions are given in Table 1.

Table 1: Delay and Levels of Service: Existing Conditions

Intersection		Overall	Northbound			Southbound			Eastbound			Westbound		
			L	T	R	L	T	R	L	T	R	L	T	R
Jefferson Ave & Hemlock Rd	AM	4.2 A		4.7 A			1.6 A			35.7 D			19.9 B	
	PM	3.9 A		1.6 A			3.4 A			41.9 D			37.5 D	
Jefferson Ave & McLawhorne Dr	AM	4.1 A	1.6 A	1.2 A		2.1 A	1.5 A			50.8 D	14.1 B	38.0 D	24.4 C	
	PM	4.3 A	0.5 A	0.5 A		11.3 B	4.0 A			59.1 E	19.7 B	43.4 D	27.8 C	

Currently, both intersections operate at an acceptable LOS "A" during both the AM and PM peak hours. Figure 4 presents the 2010 corridor traffic counts on the three (3) adjacent public roadways.

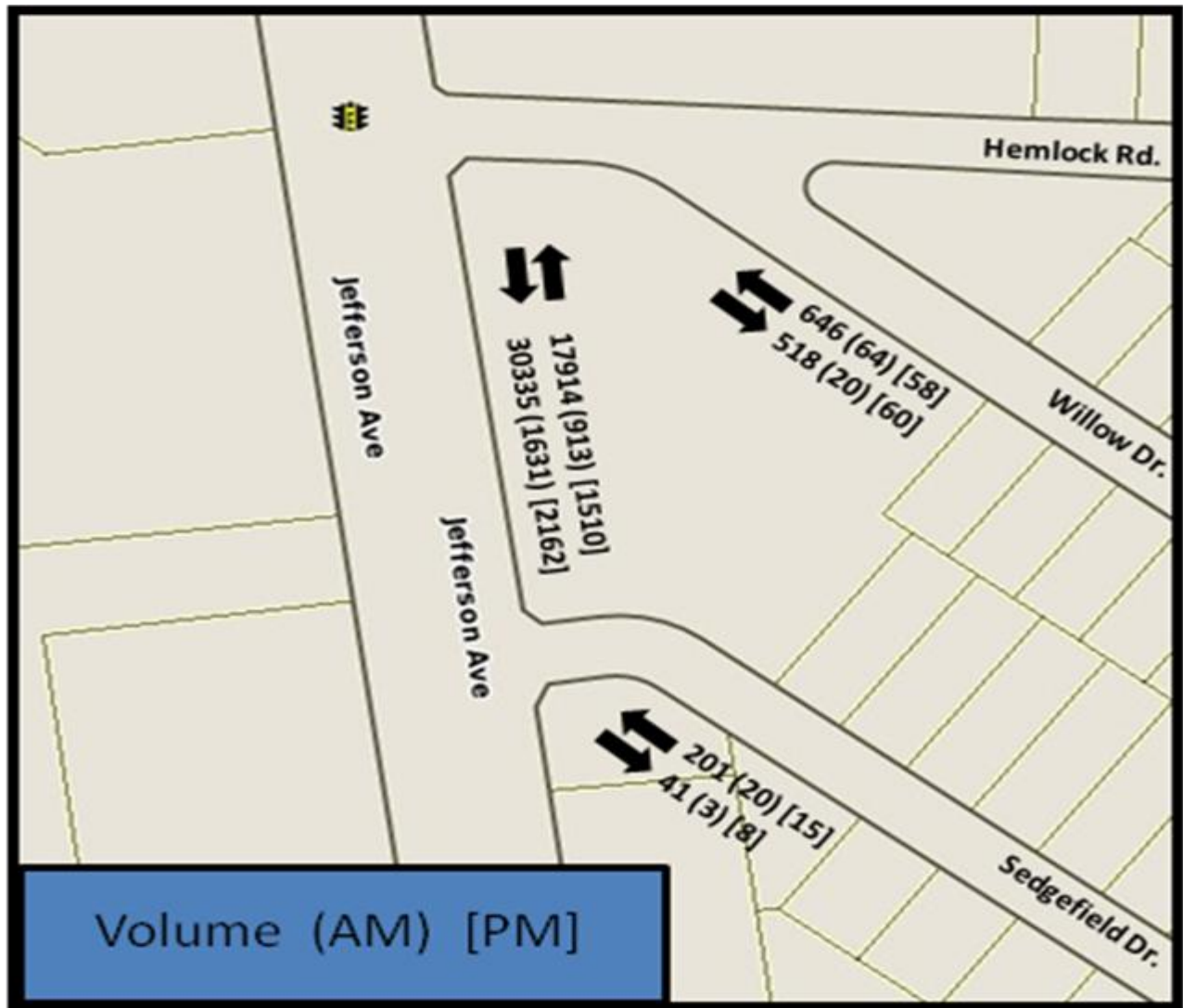
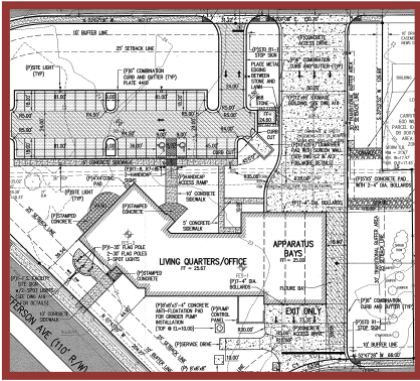


Figure 4



# 3

# Trip Generation / Distribution

Typically the ITE Trip Generation Manual is used to determine the estimated trips any particular land use will generate. However, a Fire Station is not a predefined land use and no projections were calculated. Therefore, the Department of Engineering conducted a survey of the existing Fire Station No. 3.

For this particular use there are two separate and unique trip types, emergency vehicles in response and passenger vehicles for the employees. The employee trip generation is solely based on the staffing and shift operations of the fire station. The Fire Department operates on a 24 hour shift beginning and ending at 0800 hours (8:00 AM). The station is proposed to house 12 employees which results in 24 trips all linked to the AM peak with a 50/50 inbound outbound split inbound and outbound. Taking into account employees coming and going to the station for supplies etcetera a 25% additional trip factor was applied to generate an additional 6 trips linked to the daily generation but not the AM or PM peak hours with a 50/50 split.

For the emergency vehicle in response generation, the survey included the average number of calls for service the station receives, 2500 calls for service for this district. This number is based on the apparatus currently housed at the station, one (1) engine and one (1) medic. Conservatively, it is estimated that 50% of the calls have both apparatus responding to the scene.

Therefore, this results in 7,500 trips per year  $[(2,500 + 1,250 \text{ 2}^{\text{nd}} \text{ vehicle}) \times 2 \text{ leave and return}]$  or 20 per day with a 50/50 inbound outbound split. These 20 trips per day would be random calls for service through the 24 hour period. To be conservative it is estimated that there will be four (4) AM and PM peak trips with a 50/50 inbound outbound split.

The proposed station will house (1) engine, one (1) medic, one (1) ladder and the on duty battalion chief. The addition of the ladder was estimated to increase the annual calls for service by 15%. Therefore it is estimated that the proposed station will handle 2,875 calls per year. With the addition of the battalion chief the conservative estimate of 2 apparatus reporting to a call was increased from 50% to 75%. This results in 10,062 trips per year  $[(2,875 + 2,156 \text{ 2}^{\text{nd}} \text{ vehicle}) \times 2 \text{ leave and return}]$  or 28 per day with a 50/50 inbound outbound split. These 28 trips per day would be random calls for service through the 24 hour period. To be conservative it is estimated that there will be six (6) AM and PM peak trips with a 50/50 inbound outbound split.

Review of traffic patterns and reports of speeding as well as other adverse conditions routinely considers an investigation of accident experience and trends for a 36-month period (07/01/00 – 06/30/03). Within the community, there have been a total of 3 reportable accidents. Note that an accident has to either generate \$1,000 or more in damage, have injuries or involve a City vehicle to be classified as “reportable”. In addition, this report includes accidents at the intersections of the ingress/egress points. See Appendix “B” for detail summary of the accident experience.

The total trip generation for the proposed relocated Fire Station No. 3 is given in Table 2.

Table 2: Relocated Fire Station No. 3 Trip Generation Rates

Vehicle Type	Daily	AM Peak Hour			PM Peak Hour		
		Enter	Exit	Total	Enter	Exit	Total
Employee	30	12	12	24	0	0	0
Fire Apparatus	28	3	3	6	3	3	6
<b>TOTAL</b>	<b>58</b>	<b>15</b>	<b>15</b>	<b>30</b>	<b>3</b>	<b>3</b>	<b>6</b>



The map displays the intersection of Jefferson Ave and Sedgefield Dr. Jefferson Ave runs vertically, and Sedgefield Dr runs diagonally from the bottom-left to the top-right. Other streets shown include Hemlock Rd, Spruce Rd, Willow Dr, and McLawhorne Dr. Traffic signals are located at the intersection of Jefferson Ave and Sedgefield Dr, and at the intersection of Jefferson Ave and Hemlock Rd. Directional movement arrows are shown for each approach, with distribution percentages for employees and apparatus provided for each movement. A legend in the top right corner defines the symbols used.

**Legend:**

- Traffic Signal
- Stop Sign Control
- Directional Movement
- Distribution Percentage  
{XX}% Employee [XX] % Apparatus

**Map Data:**

**Jefferson Ave / Sedgefield Dr Intersection:**

- Northbound (Jefferson Ave): (0%) [0%], (0%) [0%], (0%) [0%]
- Southbound (Jefferson Ave): (0%) [0%], (0%) [0%], (0%) [0%]
- Eastbound (Sedgefield Dr): (100%) [0%], (100%) [100%]
- Westbound (Sedgefield Dr): (0%) [0%], (0%) [0%], (0%) [0%]
- Southbound (Sedgefield Dr): (0%) [0%], (0%) [0%], (0%) [0%]
- Northbound (Sedgefield Dr): (0%) [0%], (50%) [50%], (0%) [0%]

**Jefferson Ave / Hemlock Rd Intersection:**

- Northbound (Jefferson Ave): (50%) [0%], (0%) [0%], (50%) [0%]
- Southbound (Jefferson Ave): (50%) [0%], (0%) [0%], (50%) [0%]

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**Traffic Impact Assessment – Fire Station 3 Relocated**

The signalized intersections identified within the area of study were analyzed to determine the expected 2010 traffic conditions with the proposed relocated Dire Station No. 3 and document the expected LOS at the intersections. The projected traffic volumes used in the 2010 Build Scenario include two values: background traffic and site trip generation.

The traffic volumes on Figure 6a & 6b show the background traffic on the left, followed by the proposed employee trips in brackets and the proposed apparatus trips in parentheses. The three (3) values are totaled to the far right of the directional movement arrows.

$$\text{Background} + [\text{Employee}] + (\text{Apparatus}) = \text{Total}$$

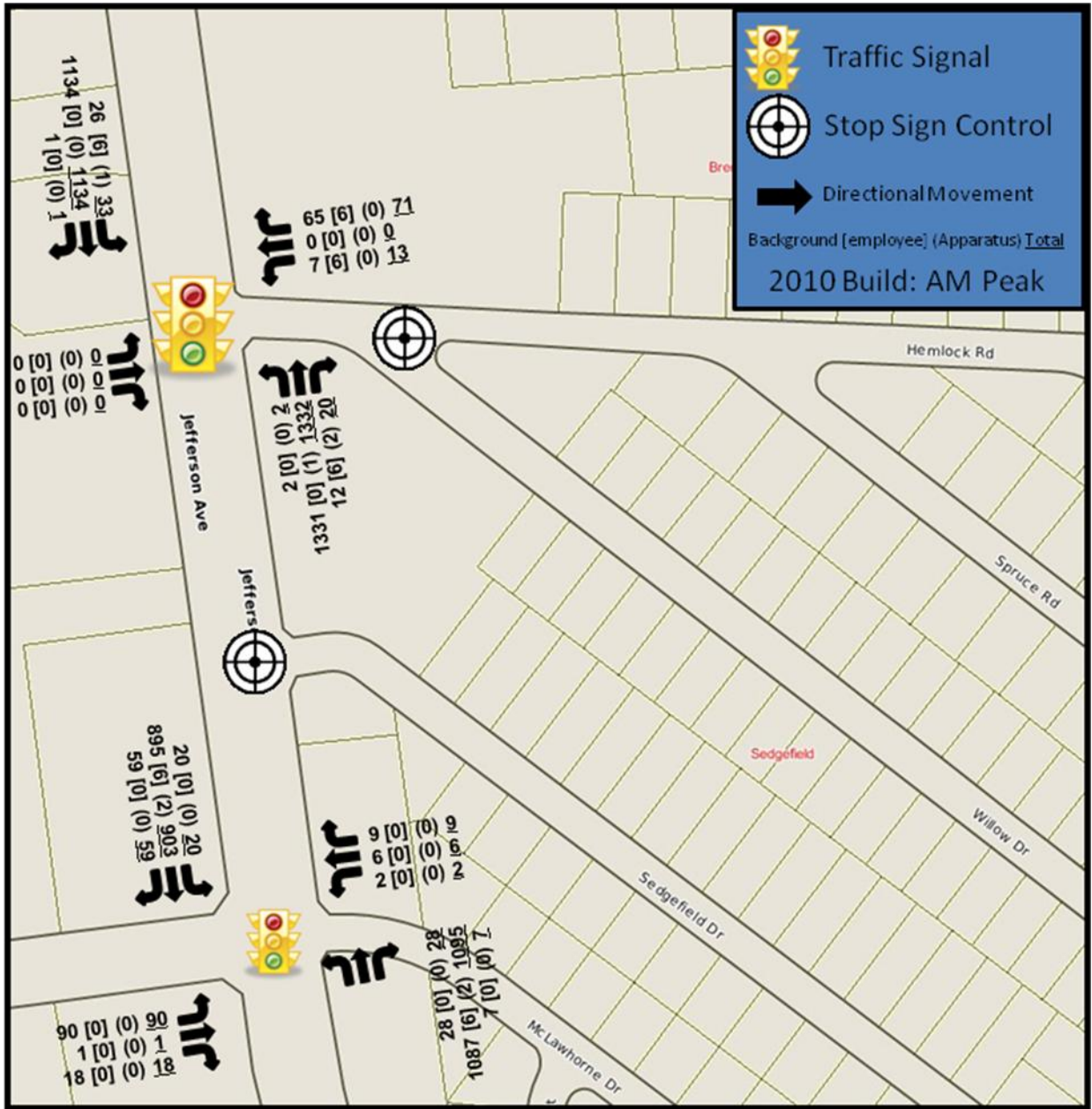


Figure 6a



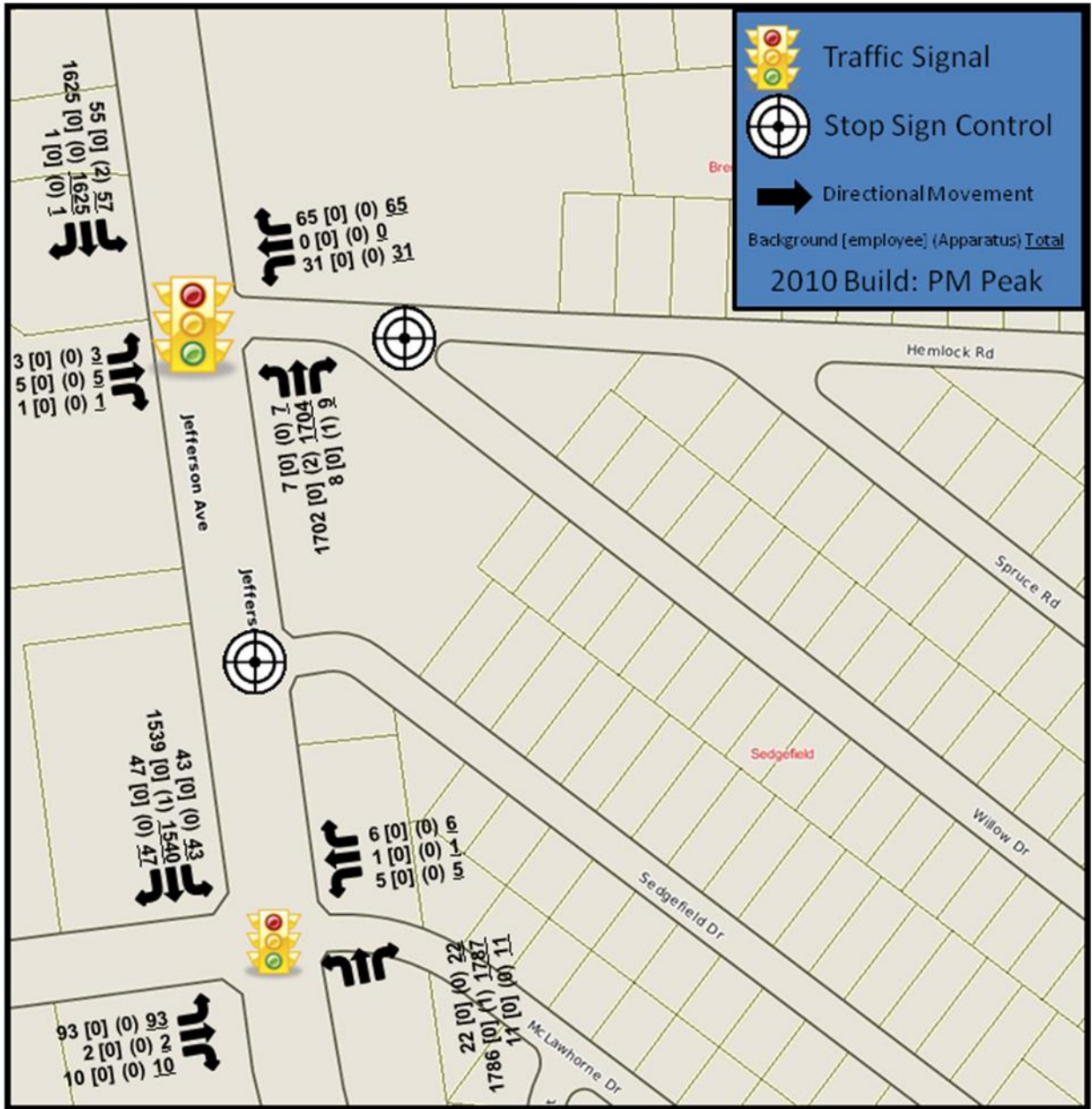


Figure 6b



A re-evaluation of the Level of Service for the two intersections was performed based on the proposed traffic with the Relocated Fire Station No. 3 being constructed. The delay and LOS which correspond with each lane group for the 2010 Build conditions are given in table 3.

Table 3: Delay and Levels of Service: 2010 Build Conditions

Intersection		Overall	Northbound			Southbound			Eastbound			Westbound		
			L	T	R	L	T	R	L	T	R	L	T	R
<i>Jefferson Ave &amp; Hemlock Rd</i>	<i>AM</i>	<i>4.9</i> <i>A</i>		<i>5.5</i> <i>A</i>			<i>1.9</i> <i>A</i>			<i>35.7</i> <i>D</i>			<i>22.0</i> <i>C</i>	
	<i>PM</i>	<i>4.1</i> <i>A</i>		<i>1.9</i> <i>A</i>			<i>3.5</i> <i>A</i>			<i>41.9</i> <i>D</i>			<i>37.5</i> <i>D</i>	
<i>Jefferson Ave &amp; McLawhorne Dr</i>	<i>AM</i>	<i>4.1</i> <i>A</i>	<i>1.6</i> <i>A</i>	<i>1.2</i> <i>A</i>		<i>2.1</i> <i>A</i>	<i>1.5</i> <i>A</i>			<i>50.8</i> <i>D</i>	<i>14.1</i> <i>B</i>	<i>38.0</i> <i>D</i>	<i>24.4</i> <i>C</i>	
	<i>PM</i>	<i>4.3</i> <i>A</i>	<i>0.5</i> <i>A</i>	<i>0.5</i> <i>A</i>		<i>11.3</i> <i>B</i>	<i>4.0</i> <i>A</i>			<i>59.1</i> <i>E</i>	<i>19.7</i> <i>B</i>	<i>43.4</i> <i>D</i>	<i>27.8</i> <i>C</i>	

With the additional traffic added to the network, both intersections operate at an acceptable LOS “A” during both the AM and PM peak hours.

A comparison of the delay and LOS for both the existing and 2010 Build conditions is given in table 4.

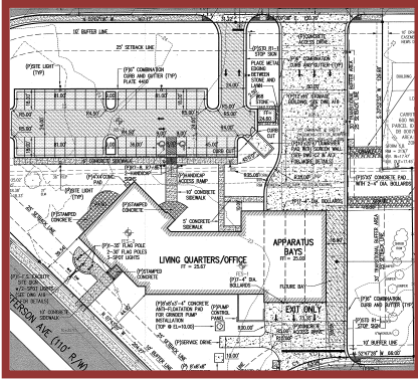
Table 4: Delay and Levels of Service: Comparison

Intersection		Overall	Northbound			Southbound			Eastbound			Westbound		
			L	T	R	L	T	R	L	T	R	L	T	R
Jefferson Ave & Hemlock Rd EXIST	AM	4.2 A		4.7 A			1.6 A			35.7 D			19.9 B	
	PM	3.9 A		1.6 A			3.4 A			41.9 D			37.5 D	
<i>Jefferson Ave &amp; Hemlock Rd 2010 BUILD</i>	<i>AM</i>	<i>4.9</i> <i>A</i>		<i>5.5</i> <i>A</i>			<i>1.9</i> <i>A</i>			<i>35.7</i> <i>D</i>			<i>22.0</i> <i>C</i>	
	<i>PM</i>	<i>4.1</i> <i>A</i>		<i>1.9</i> <i>A</i>			<i>3.5</i> <i>A</i>			<i>41.9</i> <i>D</i>			<i>37.5</i> <i>D</i>	
Jefferson Ave & McLawhorne Dr EXIST	AM	4.1 A	1.6 A	1.2 A		2.1 A	1.5 A			50.8 D	14.1 B	38.0 D	24.4 C	
	PM	4.3 A	0.5 A	0.5 A		11.3 B	4.0 A			59.1 E	19.7 B	43.4 D	27.8 C	
<i>Jefferson Ave &amp; McLawhorne Dr 2010 BUILD</i>	<i>AM</i>	<i>4.1</i> <i>A</i>	<i>1.6</i> <i>A</i>	<i>1.2</i> <i>A</i>		<i>2.1</i> <i>A</i>	<i>1.5</i> <i>A</i>			<i>50.8</i> <i>D</i>	<i>14.1</i> <i>B</i>	<i>38.0</i> <i>D</i>	<i>24.4</i> <i>C</i>	
	<i>PM</i>	<i>4.3</i> <i>A</i>	<i>0.5</i> <i>A</i>	<i>0.5</i> <i>A</i>		<i>11.3</i> <i>B</i>	<i>4.0</i> <i>A</i>			<i>59.1</i> <i>E</i>	<i>19.7</i> <i>B</i>	<i>43.4</i> <i>D</i>	<i>27.8</i> <i>C</i>	

Based on the comparison the change was negligible if at all.

# 4

## Conclusions



Under the 2010 Build Scenario with the existing traffic volumes and, the addition of the proposed Fire Station No. 3 relocated site trips, both intersections operate at an acceptable LOS “A” during the AM and PM peak hours. As there was little to no change in the Level of Service and delay between the existing and 2010 Build conditions, it has been determined that no improvements are warranted for either intersection.

However, to facilitate the response times for the emergency vehicles, it is recommended that each of the signalized intersections be equipped with the City’s standard emergency vehicle detection pre-emption device. This will allow the signals to detect when the emergency apparatus is leaving the station so that the signals can stop traffic approaching the un-signalized intersection of Jefferson Avenue and Sedgefield Drive. Additionally, as the existing intersection of Jefferson Avenue and Sedgefield Drive is a “T” intersection it is recommended to create a median break at Sedgefield Drive on Jefferson Avenue signed for emergency vehicles only to increase response time for apparatus needing to head south on Jefferson Avenue.